

E_T Distributions and other Event-by-Event Fluctuations

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- The event by event average p_T for charged particles, denoted M_{p_T} , was discussed and results were presented for the PHENIX 200 GeV data.

$$M_{p_T} = \overline{p_T(n)} = \frac{1}{n} \sum_{i=1}^n p_{T_i} = \frac{1}{n} E_{Tc}$$

- “ M_{p_T} is not a Gaussian, it’s a Gamma distribution” because the semi-inclusive p_T distribution is a Gamma distribution and particle emission in Au+Au collision is very close to being a statistical independent sample from the semi-inclusive distribution.

- To see deviations from random emission, the measured M_{p_T} distributions as a function of centrality are compared to the ‘random baseline’ of mixed events which match the multiplicity and $\langle p_T \rangle$ of the data to high precision, much better than 1 %.

- A non-random fluctuation F_t on the order of a few percent of the standard deviation is observed which increases as the p_T range of the measurement is increased. (And may increase with solid angle according to STAR).

- E_T and multiplicity distributions measured by PHENIX at 200 GeV for Au+Au have a similar centrality dependence to the 130 GeV measurements, with an overall increase by a constant factor of ~ 1.15 .

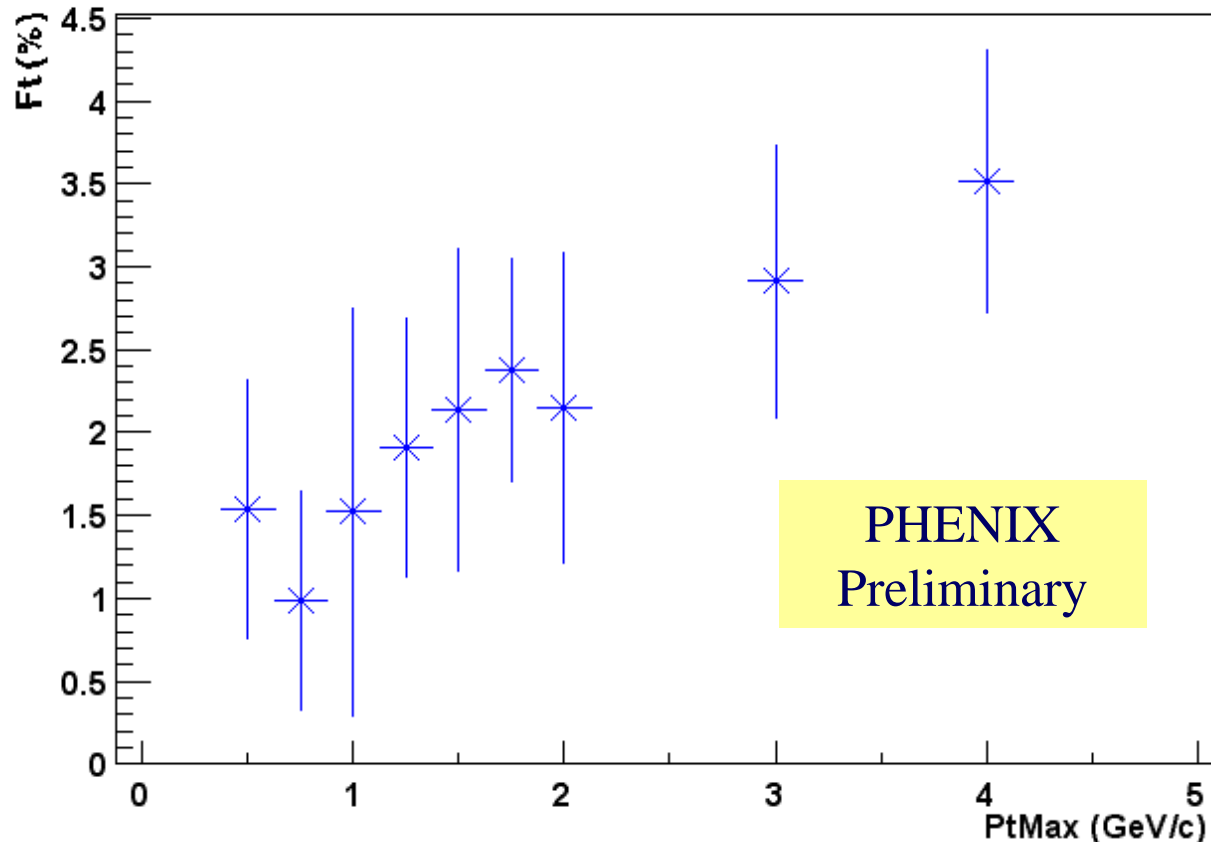
- E_T and multiplicity distributions from p+p collisions when they become available will provide the basis for Wounded Nucleon style analyses of the entire Au+Au E_T distribution, including fluctuations of the upper edge, and may add additional enlightenment on any p_T correlations as possibly indicated by M_{p_T} .

- Event-by-event net charge fluctuations at 130 and 200 GeV are consistent with random emission of hadrons with conserved total charge, with some evidence for slight ($\sim\%$) short-range charge correlation due to resonance production.

CURRENT AND FUTURE DIRECTIONS AT RHIC, AUGUST 8, 2002



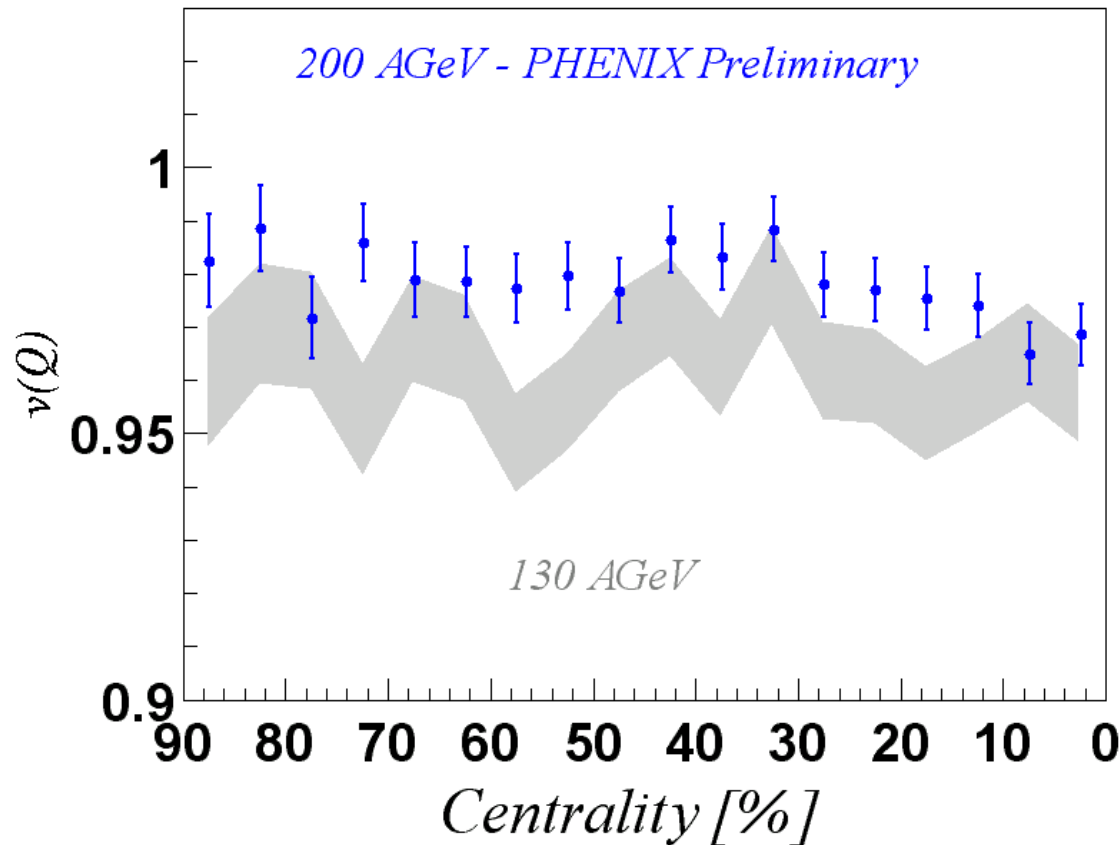
The fluctuation magnitude tends to increase as the p_T range used to calculate $\langle p_T \rangle$ is extended to higher values.



F_T vs. P_T range
($0.2 < p_T < p_{T, max}$)

Centrality and p_T dependence similar to elliptic flow.

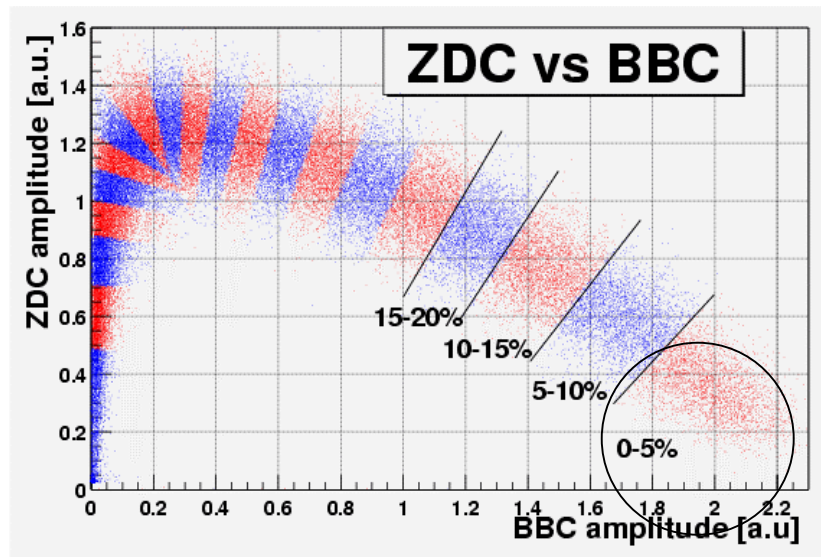
Simulations using PHENIX preliminary p_T -dependent v_2 measurements wrt to the reaction plane can, however, not reproduce the signal.



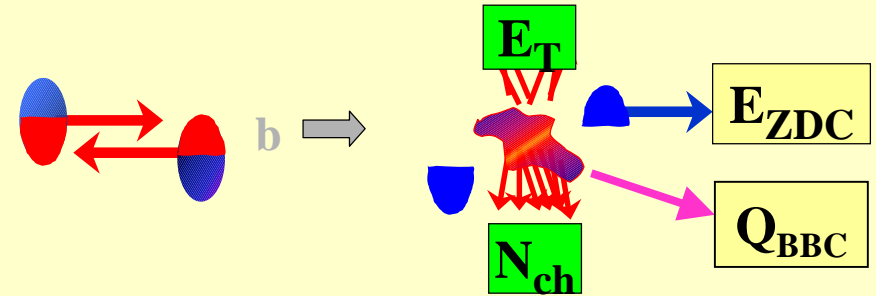
A small deviation from stochastic emission observed at 130 GeV
K. Adcox et al. (PHENIX) nucl-ex/0203014 to appear in PRL

No dramatic change at 200 GeV - the upward shift of ~ 0.01 units can be explained by harder track quality cuts leading to a reduced acceptance.

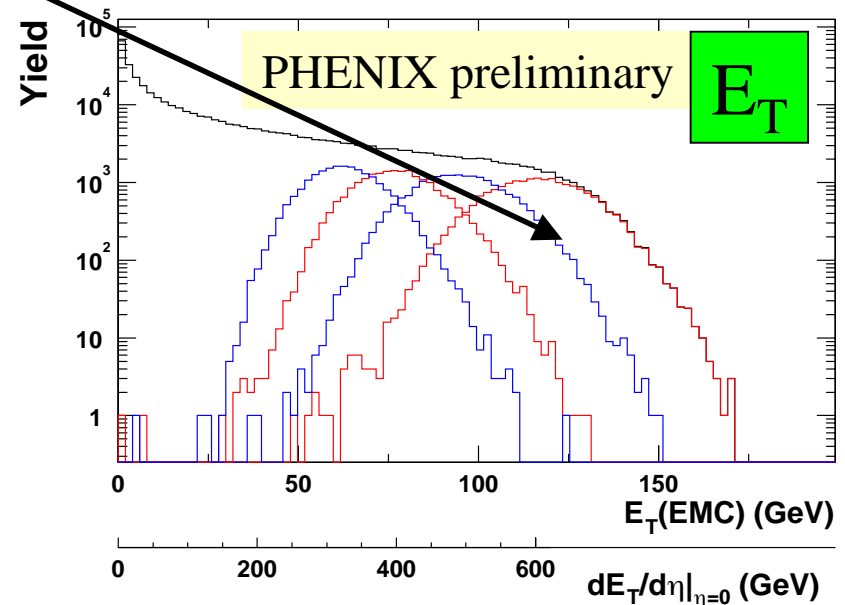
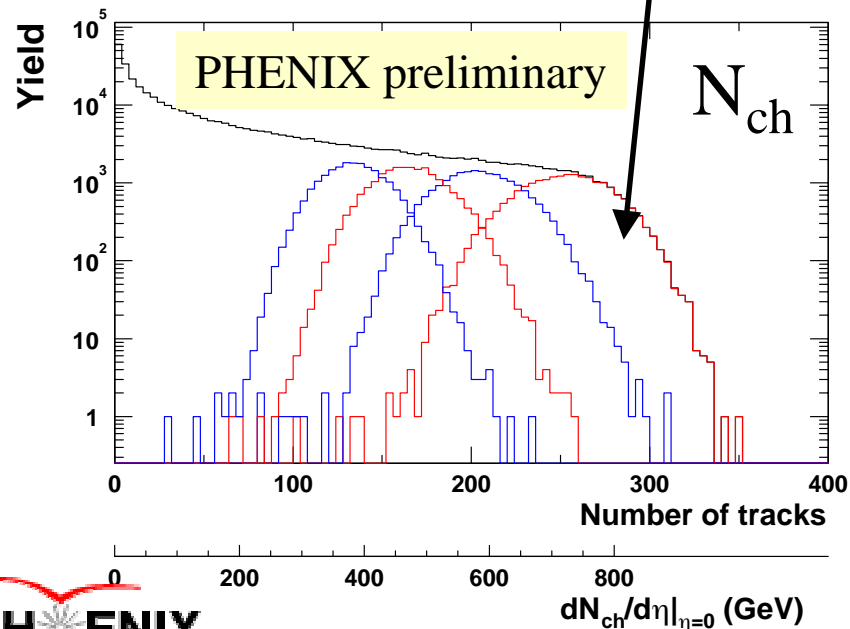
Centrality Selection



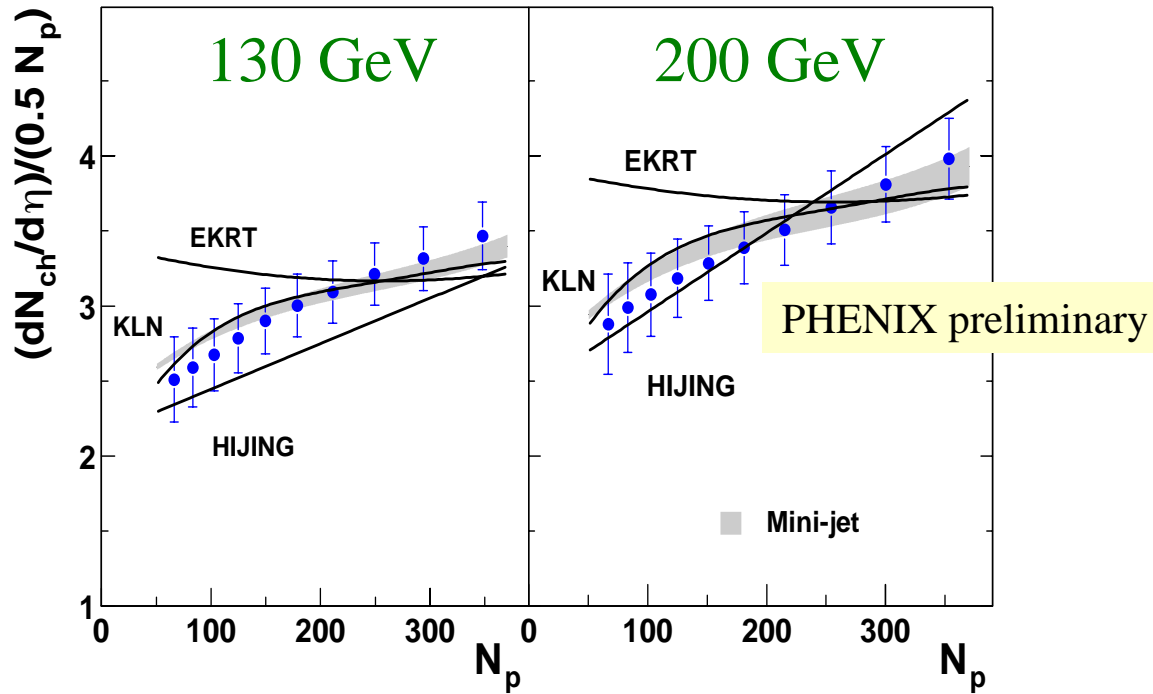
Define centrality classes: ZDC vs BBC



Extract N participants: Glauber model



Comparison to theory



HIJING **X**

X.N.Wang and M.Gyulassy,
PRL 86, 3498 (2001)

Mini-jet

S.Li and X.N.Wang
Phys.Lett.B527:85-91 (2002)

EKRT **X**

K.J.Eskola et al,
Nucl Phys. B570, 379 and
Phys.Lett. B 497, 39 (2001)

KLN

D.Kharzeev and M. Nardi,
Phys.Lett. B503, 121 (2001)
D.Kharzeev and E.Levin,
Phys.Lett. B523, 79 (2001)

